

# **CAP DEVICE FOR MIXING DIFFERENT KINDS OF MATERIALS SEPARATELY CONTAINED THEREIN AND IN BOTTLE**

## **BACKGROUND OF THE INVENTION**

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### **1. Field of the Invention**

The present invention relates, in general, to a cap for bottles which is capable of quickly mixing different kinds of materials to prepare a mixture and, more particularly, to a cap device for bottles, which allows a user to mix an additive contained in the cap device with a material  
10 contained in a bottle to prepare a mixture by simply rotating the cap device relative to the bottle, thus easily preparing the mixture just before drinking or using the mixture.

### **2. Description of the Related Art**

In the prior art, most conventional disposable bottles circulated and sold in markets each  
15 contain therein only a single kind of material, such as a drink, a liquid medicine or a liquid chemical, and are closed by caps at the mouths thereof.

When a user wants to add an additive to the material contained in such a capped bottle so as to prepare a mixture prior to drinking or using the mixture, the user must add the additive from a separate container to the bottled material after removing a cap from the bottle. Therefore, it is  
20 necessary for manufacturers of the additives and the bottled materials to separately contain such additives and materials in separate containers and bottles prior to marketing them, thus undesirably wasting natural resources due to the production of the separate containers and capped bottles. In addition, the adding of the additive from the separate container to the bottled material to mix them after removing the cap from the bottle is inconvenient to the user in that the user is forced to  
25 separately purchase and handle the additive container and the bottle. Furthermore, it is extremely

difficult for the user to add a precise amount of the additive from the separate container to the material contained in the bottle, and so, typically the user roughly measures the amount of the additive to be added to the bottled material. Therefore, in the case of mixing an additive with a bottled drink to produce a mixed beverage, the rough measurement of the amount of the additive may result in a change in the taste and quality of the mixed beverage. In the case of mixing an additive with a bottled liquid medicine or a bottled liquid chemical to produce a mixed medicine or a mixed chemical, the rough measurement of the amount of the additive may result in incomplete dissolution of effective ingredients of the additive in the medicine or the chemical and a failure of accomplishment of desired medical or chemical effects of the mixed medicine or the mixed chemical.

In an effort to overcome the above-described problems, the inventor of the present invention proposed a cap device for bottles, which is capable of quickly mixing different kinds of materials to prepare a mixture. The construction of the cap device is shown in FIG. 1. As shown in the drawing, the cap device comprises a cap body 50, and a cap cover 100 assembled with the cap body 50 to define a cavity therein to contain an additive in the cavity. The cap cover 100 thus acts as a containing unit for an additive. The cap device also has a valve member 120K which is seated in the neck of a bottle 13 to allow the cavity defined by the cap body 50 and the cap cover 100 to selectively communicate with the interior of the bottle 13.

The valve member 120K is provided at the center thereof with a valve part 122. A plurality of radial ribs 124 extend outward from an external surface of the valve part 122 in radial directions, and the outside ends of the radial ribs 124 are integrated with a circular ring so that a plurality of additive discharging holes are formed at the valve member 120K.

The cap body 50 has internal threads to engage with the externally threaded mouth of the bottle 13. A funnel part 54 is integrally formed in the cap body 50 to discharge the additive into the bottle 13 through a lower end 52 thereof.

The cap cover 100 is assembled at the lower end thereof with the upper end of the cap body 50 to cover the open upper end of the cap body 50 while defining the cavity inside both the cap body 50 and the cap cover 100 to contain the additive in the cavity. A vent hole 102 is formed at a predetermined position of the top wall of the cap cover 100.

5        A step 120S is formed around the inner surface of the neck of the bottle 13 to seat the valve member 120K in the neck of the bottle 13.

When the cap body 50 is rotated to move upward relative to the externally threaded mouth of the bottle 13, the lower end 52 of the funnel part 54 is separated from the valve part 122 of the valve member 120K which is seated on the step 120S of the bottle 12, thus causing the cavity of  
10    the cap device containing the additive to communicate with the interior of the bottle 13 containing the material.

In such a case, the vacuum pressure acting on the surface of the additive contained in the cavity of the cap device is released because atmospheric air is introduced into the cavity through the vent hole 102 of the cap cover 100. The additive thus smoothly flows from the cavity of the  
15    cap device into the bottle 13.

Therefore, the additive flows from the cavity of the cap device into the interior of the bottle 13 through the open lower end 52 of the funnel part 52 and the additive discharging holes of the valve member 120K.

After the additive is mixed with the bottled material to produce a desired mixture in the  
20    bottle 13, the user completely removes the cap device having the cap body 50 and the cap cover 100 from the mouth of the bottle 13 to drink or use the mixture.

However, this proposed cap device as described is problematic as follows. First, even when the cap device having the cap body 50 and the cap cover 100 is completely removed from the mouth of the bottle 13 as described above, the valve member 120K remains in the neck of the  
25    bottle 13, thus undesirably reducing the flow rate of the mixture which is discharged from the

bottle 13. Therefore, it is impossible to quickly discharge the mixture from the bottle 13.

Second, the vent hole 102, which introduces the atmospheric air into the cavity of the cap device to release the vacuum pressure acting on the surface of the additive contained in the cavity of the cap device, is formed on the top wall of the cap cover 100 so as to be exposed to the atmosphere. Therefore, harmful substances, such as poisonous substances, may be maliciously injected into the cap device through the exposed vent hole 102. The pure state of the additive may be thus lost, and, furthermore, the user may be fatally poisoned when a poisonous substance is maliciously injected into the cap device.

Third, the step 120S must be formed around the inner surface of the neck of the bottle 13 to seat the valve member 120K thereon, and it is difficult and most costly to produce the bottle having the step through an injection molding process. Furthermore, the production time of the bottle is excessively increased, resulting in a reduction in workability and productivity while producing such bottles.

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## **SUMMARY OF THE INVENTION**

Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a cap device for bottles, which allows the additive and the bottled material to be safely maintained in their respective pure states without being mixed together before a user adds the additive to the bottled material, thus being free from physical or chemical problems of degradation in the properties of ingredients, change in colors, and a generation of floating matters and deposits experienced in conventional bottled mixtures marketed in a bottled state.

Another object of the present invention is to provide a cap device for bottles, which does not force the user to separately purchase, store, carry and handle an additive container and a bottle

containing the material, thus being convenient to the user, and which is free from excessive consumption of labor, time and natural resources due to the separate production of the containers for additives and capped bottles.

A further object of the present invention is to provide a cap device for bottles, which  
5 allows the user to mix the precise amount of the additive with the bottled material to prepare the mixture, so that it is possible to prevent variations in the taste and quality of the mixture in the case of preparing a mixed beverage through the mixing, and to prevent incomplete dissolution of effective ingredients of the additive in the bottled material or a failure of accomplishment of desired medical or chemical effects of the mixture in the case of preparing a mixed medicine or a  
10 mixed chemical through the mixing.

Yet another object of the present invention is to provide a cap device for bottles, which quickly discharges a mixture from a bottle as desired, and almost completely empties the bottle, and which prevents a malicious injection of harmful substances, such as poisonous substances, into the cap device, thus allowing the user to safely drink or use the liquid, and in which a step is easily  
15 and simply formed on an inner surface of a neck of the bottle through an injection molding process, so that the bottle is produced without consumption of excessive time, thus improving workability and productivity while producing the bottles.

In order to accomplish the above objects, the present invention provides a cap device for bottles, having a valve member placed in a neck of a bottle; a cap body tightened to an externally  
20 threaded mouth of a bottle and opened or closed at a lower end of a funnel part thereof by the valve member; and a cap cover assembled with the cap body to define a cavity therein to contain an additive in the cavity, wherein the neck of the bottle is tapered downward on an inner surface thereof. The valve member is provided with a valve part at a center thereof to open or close the lower end of the funnel part of the cap body, with a plurality of radial ribs extending outward from  
25 an external surface of the valve part while defining a plurality of additive discharging holes

between the radial ribs. The valve member also has a ring to surround outside ends of the radial rings and a wedge-tipped shank vertically extending upward from a center of the valve part. A tapered surface is formed along an outer surface of the ring to correspond to the tapered inner surface of the neck of the bottle; and a vent hole is formed at a predetermined position of an upper  
5 end of the funnel part of the cap body.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the  
10 accompanying drawings, in which:

FIG. 1 is a sectional view showing the construction of a conventional cap device for bottles, which is designed to mix an additive contained therein with a material contained in a bottle to prepare a mixture;

FIG. 2 is an exploded perspective view to show the construction of a cap device for  
15 bottles, according to a first embodiment of the present invention;

FIG. 3 is an exploded sectional view to show the construction of the cap device of FIG. 2;

FIG. 4 is a sectional view to show the cap device of FIG. 2, when the cap device is fully tightened to the mouth of a bottle after the parts of the cap device are assembled into a single body;

FIG. 5 is a sectional view to show the cap device of FIG. 2, when the cap device is  
20 loosened from the mouth of the bottle;

FIG. 6 is a sectional view to show the cap device of FIG. 2, when the cap device is completely removed from the mouth of the bottle along with a valve member;

FIGS. 7 and 8 are sectional views to show the construction of a cap device for bottles, according to a second embodiment of the present invention, in which: FIG. 7 is an exploded  
25 sectional view of the cap device, and FIG. 8 is a sectional view of the cap device with the parts

assembled into a single structure;

FIG. 9 is a sectional view showing the construction of a cap device for bottles, according to a third embodiment of the present invention; and

FIG. 10 is a sectional view showing the construction of a cap device for bottles according to a further embodiment of the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

Reference should now be made to the drawings, in which the same reference numerals are used throughout the different drawings to designate the same or similar components.

(First embodiment)

FIGS. 2 and 3 are views showing the construction of a cap device for bottles, according to the first embodiment of the present invention. As shown in the drawings, the cap device according to the first embodiment of the present invention comprises a cap body 50, and a cap cover 100 assembled with the cap body 50 to define a cavity therein to contain an additive within the cavity. The cap cover 100 thus functions as a container for an additive in this first embodiment. The cap device also has a valve means to allow the cavity defined by the cap body 50 and the cap cover 100 to selectively communicate with the interior of a bottle 13. In the first embodiment, the valve means comprises a valve member 120K seated in the neck of the bottle 13.

In the first embodiment as shown in figures 3 to 6, the neck of the bottle 13 is formed to be tapered downward on its inner surface 16a.

The valve member 120K is provided in the neck with a valve part 122 which acts as a valve seat. The valve part 122 of the valve member 120K closes or opens the lower end of a funnel part 54 of the cap body 50 in accordance with a rotating action of the cap body 50 relative to the mouth of the bottle 13. A plurality of radial ribs 124 extend outward from an external surface

of the valve part 122 in radial directions, and the outside ends of the radial ribs 124 are integrated with a circular ring, so that a plurality of additive discharging holes are formed at the valve member 120K.

5 The valve member 120K also has a wedge-tipped shank 126 which vertically extends upward from the center of the valve part 122, with a wedge-shaped tip provided at the top end of the shank 126. The circular ring of the valve part 120K is tapered at the outer surface thereof to form a tapered surface 16b which corresponds to the tapered inner surface 16a of the neck of the bottle 13.

10 The cap body 50 has internal threads to engage with the externally threaded mouth of the bottle 13. The funnel part 54 is integrally formed in the cap body 50 to discharge the additive into the bottle 13 through a lower end 52 thereof. A vent hole 18 is formed at a predetermined position of the upper end of the funnel part 54.

The cap cover 100 is assembled at the lower end thereof with the upper end of the cap body 50 to cover the open upper end of the cap body 50 while defining the cavity inside both the cap body 50 and the cap cover 100 to contain the additive in the cavity.

15 When the internally threaded cap body 50 assembled with the cap cover 100 of the cap device is tightened to the externally threaded mouth of the bottle 13, the wedge-tipped shank 126 of the valve member 120K previously set in the neck of the bottle 13 is inserted into the lower end 52 of the funnel part 50, thus being positioned in the funnel part 54. Therefore, the valve member 20 120K is assembled with the cap device, as shown in FIG. 4. When the cap body 50 is fully tightened to the mouth of the bottle 13, the lower end 52 of the funnel part 54 comes into close contact with the valve part 122 of the valve member 120K. The lower end 52 of the funnel part 54 is thus completely closed. In such a case, the vent hole 18 of the cap device is also closed by the top edge of the mouth of the bottle 13.

25 When the cap body 50 is rotated to move upward relative to the mouth of the bottle 13, as

shown in FIG. 5, the lower end 52 of the funnel part 54 is separated from the valve part 122 of the valve member 120K, thus causing the cavity of the cap device containing the additive to communicate with the interior of the bottle 13 containing the material.

Therefore, the additive flows from the cavity of the cap device into the interior of the bottle 13 through the open lower end 52 of the funnel part 52 and the additive discharging holes formed between the radial ribs 124 of the valve member 120K. In such a case, the vent hole 18 of the cap device is opened, so that the vacuum pressure acting on the surface of the additive contained in the cavity of the cap device is released because air is introduced into the cavity through the open vent hole 18. The additive thus smoothly flows from the cavity of the cap device into the bottle 13, so that the additive is easily added to the material in the bottle 13 to produce a desired mixture.

After the additive is mixed with the bottled material to produce the desired mixture in the bottle 13, the user completely removes the cap device having the cap body 50 and the cap cover 100 from the mouth of the bottle 13, as shown in FIG. 6, to drink or use the mixture. When the cap device is removed from the mouth of the bottle 13 as described above, the valve member 120K is removed from the bottle 13 along with the cap device because the valve member 120K is assembled with the cap device through the wedge-tipped shank 126.

When the valve member 120K is seated in or removed from the neck of the bottle 13, it is easy to seat or remove the valve member 120K relative to the neck of the bottle 13 because the circular ring of the valve part 120K has the tapered outer surface 16b which corresponds to the tapered inner surface 16a of the neck of the bottle 13.

[Second embodiment]

FIGS. 7 and 8 are sectional views showing the construction of a cap device for bottles, according to the second embodiment of the present invention. As shown in the drawings, the general shape of the cap device according to the second embodiment of the present invention remains the same as that described for the first embodiment, but a protective cover "C" is added to

the cap device of the second embodiment. In the second embodiment, the protective cover "C" is preferably colored as, for example, translucent brown, such that the protective cover "C" partially intercepts light, such as sunlight, transmitted into the cavity of the cap device.

That is, the cap device according to the second embodiment of the present invention has  
5 the protective cover "C", which holds the cap cover 100 by means of an upper locking means and is removably fitted over the upper part of the bottle 13 by means of a lower locking means.

The upper locking means comprises a first locking flange 100a formed along the outer edge of the top wall of the cap cover 100 acting as an additive containing part, and a first locking groove "CH" formed around the corner of a depression provided at a lower surface of a top wall of  
10 the protective cover "C". The first locking flange 100a of the cap cover 100 removably engages with the first locking groove "CH" of the protective cover "C", so that the protective cover "C" holds the cap cover 100.

The lower locking means comprises a second locking flange "T" formed around an inner surface of the lower edge of the protective cover "C", and a second locking groove "H" formed  
15 around the upper part of the bottle 13. The second locking flange "T" of the protective cover "C" is removably fitted over the second locking groove "H" of the bottle 13.

Since the cap device according to the second embodiment of the present invention has the translucent blow protective cover "C" which partially intercepts light, such as sunlight, transmitted into the cavity of the cap device, it is possible to preserve the additive in the cavity of the cap  
20 device for a lengthy period of time, without allowing a chemical or physical change in the additive.

When the cap device has the translucent brown protective cover with the above-described light intercepting effects, it is possible to produce the cap cover 100 of the cap device by use of transparent materials. The protective cover also protects the cap cover 100 from external impact, thus preventing unexpected loss of the additive.

25 In addition, since the protective cover "C" has a large diameter, the user can easily rotate

the cap device with small force, relative to the mouth of the bottle 13.

[Third embodiment]

FIG. 9 is a sectional view showing the construction of a cap device for bottles, according to the third embodiment of the present invention. As shown in the drawing, the general shape of the cap device according to the third embodiment remains the same as that described for the second embodiment, but the cap device of the third embodiment has a step 14, in place of the tapered inner surface 16a. The step 14 is formed around the inner surface of the neck of a bottle 13 to stably and removably seat a valve member 120K in the neck of the bottle 13. That is, the cap device of the third embodiment has the valve member 120K seated in the neck of the bottle 13, and a cap body 50 assembled with a cap cover 100 to define a cavity to contain an additive therein. The cap cover 100 thus acts as an additive containing part in this third embodiment. The cavity is selectively opened or closed by the valve member 120K. The cap device also has a protective cover "C" to protect the cap device.

Due to the step 14 of the bottle 13, it is easy to seat and remove the valve member 120K relative to the neck of the bottle 13, in a similar manner to that described for the first and second embodiments. The detailed description of the operational effect of the cap device according to the third embodiment is thus not deemed necessary.

In accordance with the first, second, and third embodiments of the present invention, a vent tube 18a can be connected to the vent hole 18 of the cap body 50. That is, the cap device according to the first, second, and third embodiments can further comprise the vent tube 18a, which has a predetermined length and is installed in the vent hole 18 of the cap body 50, as shown in FIGS. 2 through 9.

Due to the vent tube 18a, it is possible to prevent a leakage of the additive from the cavity of the cap device through the vent hole 18, while allowing an introduction of air into the cavity through the vent hole 18. Therefore, the additive smoothly flows from the cavity of the cap device

into the bottle 13, in response to a rotating action of the cap body 50 relative to the mouth of the bottle 13.

[Fourth embodiment]

FIG. 10 is a sectional view showing the construction of a cap device for bottles, according to the fourth embodiment of the present invention. In the fourth embodiment, the bottle 13 has first and second container parts 60 and 68 at the bottom thereof to respectively contain first and second chemicals 62 and 66 in the two container parts 60 and 68. A breakable sheet 64 is provided at the open lower end of the first container part 60 to close the lower end of the container part 60. In order to break the breakable sheet 64 to open the lower end of the first container part 60 when necessary, a breaking edge 70 is provided at the inner surface of the second container part 68. A cylindrical skirt 72 integrally extends downward from the sidewall of the first container part 60 so as to surround and protect the first and second container parts 60 and 68, and allows the bottle 13 to stably stand upright on a support surface when the bottle 13 is stored on the support surface.

That is, the first container part 60 having a funnel shape is integrally provided at the bottom of the bottle 13. The first container part 60 is open at the lower end thereof to form an opening covered with the breakable sheet 64, and is externally threaded at its lower end. The first chemical 62, which absorbs heat from the surroundings to cool the surroundings when it is mixed with the second chemical 66 to produce a cooling mixture, is contained in the first container part 60.

The second container part 68 is a cup-shaped body having internal threads, and externally engages with the externally threaded lower end of the first container part 60. The second chemical 66, which absorbs heat from the surroundings to cool the surroundings when it is mixed with the first chemical 62 to produce the cooling mixture, is contained in the second container part 68.

In order to break the breakable sheet 64 to open the lower end of the first container part 60 when the second container part 68 is rotated to move upward along the externally threaded lower

end of the first container part 60, the breaking edge 70 is provided on the inner surface of the second container part 68. The cylindrical skirt 72, which integrally extends downward from the sidewall of the first container part 60, surrounds and protects the first and second container parts 60 and 68, and allows the bottle 13 to stably stand upright on the support surface.

5           In the fourth embodiment, a part of the bottom of the bottle 13 is protruded downward into the first container part 60, thus enlarging the heat exchanging surface area at which heat transfers between a bottled material and the cooling mixture produced by the mixing of the first and second chemicals. In the present invention, the first chemical 62 is preferably contained in the first container part 60 at a vacuum pressure, so that the second chemical 66 more effectively and  
10       quickly flows into the first chemical 62 when the lower end of the first container part 60 is opened.

As described above, the present invention provides a cap device for bottles, which overcomes the problems experienced in mixing two different kinds of materials to prepare a mixture by the use of a conventional cap device for bottles, and which allows the additive  
15       contained therein and a bottled material to be maintained in their respective pure states without being mixed together before a user adds the additive to the bottled material, thus being free from physical or chemical problems of degradation in the properties of ingredients, change in colors, and a generation of floating matters and deposits. The cap device for bottles of this invention also contains the additive separate from the bottled material. Therefore, the cap device does not force  
20       the user to separately purchase and handle an additive container and a bottle containing a bottled material, thus being convenient to the user, and which is free from excessive consumption of labor, time and natural resources due to the separate production of the containers for additives and capped bottles. The cap device for bottles of the present invention also allows the user to mix the precise amount of the additive with the bottled material to prepare the mixture, so that it is possible to  
25       prevent variations in the taste and quality of the mixture in the case of preparing a mixed beverage

through the mixing, and to prevent incomplete dissolution of effective ingredients of the additive in the bottled material or a failure of accomplishment of desired medical or chemical effects of the mixture in the case of preparing a mixed medicine or a mixed chemical through the mixing.

In the cap device of the present invention, a cap body, an additive containing part, and a  
5 valve means are completely removed from a bottle at the same time after the additive is mixed with the bottled material, so that it is possible to quickly discharge the mixture from the bottle.

In addition, a vent hole which introduces air into the cavity of the additive contain part to remove a vacuum pressure from the cavity, is formed in the cap body such that the vent hole is not exposed to the outside of the cap device. It is thus possible to prevent a malicious injection of  
10 harmful substances, such as poisonous substances, into the cap device through the vent hole, thus allowing the user to safely drink or use the mixture.

In the cap device of the present invention, a step for seating the valve member thereon is easily and simply formed on the inner surface of the neck of the bottle through an injection molding process, so that the bottle is produced without consumption of excessive time, thus  
15 improving workability and productivity while producing the bottles.

Although preferred embodiments of the present invention have been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.